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Matadero Creek FEMA LOMR
Bayshore Freeway to Foothill Expressway

Summary Report

Prepared for

Santa Clara Valley Water District

Prepared by

Multech Engineering Consultants, Inc.

June 26, 1997

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Mr. Iwao Shintani
Acting Supervising Engineer
Project Development Group
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3686

Ref: Matadero Creek FEMA LOMR - Bayshore Freeway to Foothill Expressway

Agreement: No. A2010T

Dear Mr. Shintani:

The purpose of this letter is to inform you the results of the referenced study and present recommendations for your consideration.

Study Results:

Pre-Project Flood Hydrology

The FEMA flood hydrology (HEC-1 input file) for the 100-year 24-hour storm for Matadero Creek for the pre-project conditions has been reconstituted for use in the FEMA LOMR.

Post-Project Flood Hydrology

Flood hydrology for the 100-year 24-hour storm for the LOMR application is being developed through revision of the FEMA HEC-1 input file for the drainage elements affected by the recent improvements of Matadero Creek, which include constructions of Barron Creek Diversion and Matadero Bypass, realignment of Matadero Creek between Alma Street and El Camino Real, and channel improvements below Alma Street.

Revision of flood hydrology for the elements above El Camino Real has been completed, while the revision for the lower portion has encountered unexpected difficulties. It was assumed at the onset of this project that the above-mentioned improvements would provide adequate flood protection along Matadero Creek and, therefore, would be qualified for removal of FEMA flood hazard designations from the area upstream of the coastal flood zone.

Our study results indicate, however, that many of the new bridges may not perform as the design has intended and will result in spill of floodwater into the adjacent floodplain in a 100-year storm. The findings are illustrated in the attached HEC-2 results for the two critical tailwater conditions at the Palo Alto Flood Basin (PAFB), as identified in the Engineer's Report for Planning Study of Matadero and Barron Creeks:

Case 1: Q = 3,500 cfs, WSEL = 3.5 ft

This case represents the tailwater conditions when the peak of flood hydrograph arrives at the PAFB. The HEC-2 results for this case are summarized in Attachment 1.

Case 2: Q = 1,500 cfs, WSEL = 5.7 ft

This case represents the tailwater conditions when the maximum water surface occurs at the PAFB, which is 5.5 hours after the peak of the flood hydrograph. The HEC-2 results for this case are summarized in Attachment 2.

The HEC-2 results for both cases show that Louis Road bridge causes flood level at its upstream face to exceed the tops of floodwalls and results in spill to the adjoining floodplain. This also occurs to the upstream bridges at Ross, Middlefield, Cowper, Waverley, Alma, Park, and Lambert. Flood elevations for Case 1 are substantially higher than for the Case 2.

The discrepancy between the present HEC-2 results and those used in the design of channel improvements are due to the difference in the way that head losses through the bridges were computed. In the design study, head loss for a bridge was computed using the so-called "normal bridge method", an option in the HEC-2 model, which assumes that open channel flow (with a free surface) would prevail through the bridge opening so that the head loss can be calculated using Manning's equation. In the present study, head loss at a bridge was computed using the so-called "special bridge method", another option of the HEC-2 model, which is capable of analyzing open channel flow (using Manning's equation), pressure flow (using orifice equation) and weir flow (using weir formula for spill over the bridge deck), and automatically uses the appropriate equation according to the prevailing flow conditions.

For the case of Matadero Creek upstream of Greer Road, the soffits of all bridges are submerged at the downstream faces, as shown in Attachments 1 and 2. Therefore, floodwater passes through the bridge openings as pressure flow and should be analyzed using "special bridge method", instead of "normal bridge method". Because of this improper use, the design study greatly underestimated the bridge head losses and, consequently, yielded a significantly lower flood profile for Matadero Creek.

Recommendations

The present study results show that, in a 100-year flood, spill will occur at all new bridges on Matadero Creek between Louis Road and Lambert Avenue. As such, flood hazard designation in the current FIRM can not be removed through a LORM. This flooding problem may be eliminated through retrofitting one or several of the new bridges with assistance of a sound hydraulic study. We suggest that a limited scope study be taken to investigate this possibility and establish the direction for future actions. The study should include the following tasks:

- Evaluate hydraulic performance of the new bridges.
- Investigate options for improving hydraulic performance of the bridges and develop retrofit alternatives in providing safe passage of floodwater through the bridges with required freeboard.
- Develop a preliminary least-cost alternative for eliminating flooding.

I appreciate your assistance and courtesy through the course of this study. I hope you will find the above recommendations useful. Multech would be interested in conducting the limited scope study for the District.

Sincerely,

Wen Wang

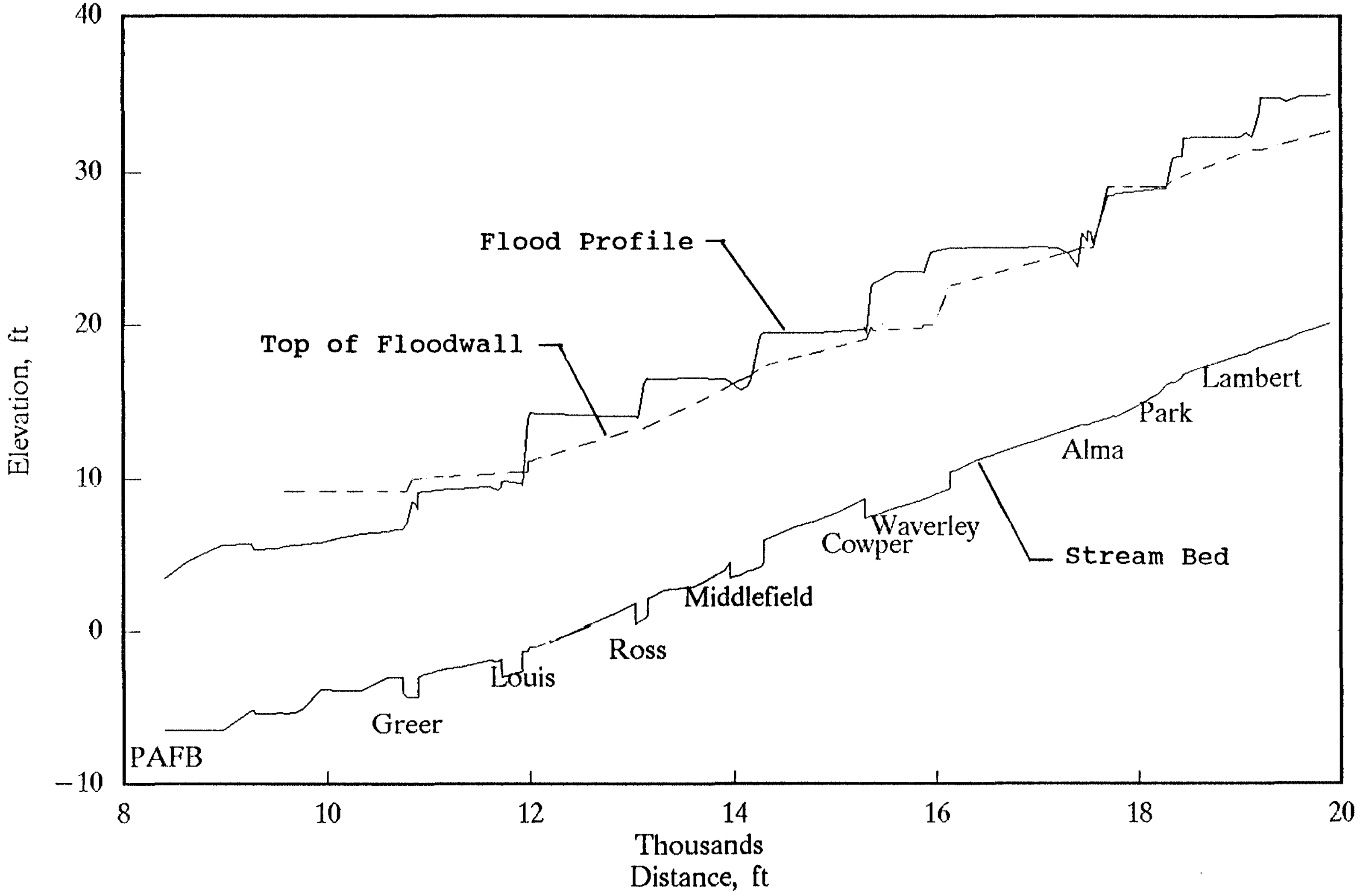
Wen C. Wang, Ph.D., P.E.
President

Attachments

Attachment 1:

Matadero Creek HEC-2 Summary Results
for the 100-Year Flood
with

Q = 3,500 cfs
WS = 3.5 ft at PAFB



Matadero Creek
The 100–Year Flood (Q = 3,500 cfs / Tide = 3.5 ft at PAFB)

Matadero Creek
HEC−2 Summary Results for the 100−Year Flood with Q = 3,500 cfs and Water Level = 3.5 ft at Palo Alto Flood Basin

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC−2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOP WIDTH ft	LOCATION
9252	0	8400		3500	3.50	4.17	−6.50	−0.10	6.20		7.84	10.00	0	108	PAFB
9452	200	8600		3500	4.53	4.99	−6.50	−0.10	6.20		6.44	11.03	200	114	
9652	400	8800		3500	5.16	5.53	−6.50	−0.10	6.20		5.74	11.66	200	120	
9827	575	8975		3500	5.67	5.74	−6.50	−0.10	6.20		2.64	12.17	175	227	
10107	855	9255		3500	5.78	5.86	−5.20	0.20	4.00		2.99	10.98	280	252	
10123	871	9271		3500	5.42	6.02	−5.20	3.00	7.00		6.24	10.62	16	74	
10144	892	9292		3500	5.41	6.05	−5.40	7.50	7.50		6.42	10.81	21	70	
10154	902	9302		3500	5.41	6.05	−5.40	7.50	7.50	7.00	6.43	10.81	10	70	Ped Bridge
10164	912	9312		3500	5.41	6.06	−5.40	10.00	10.00		6.46	10.81	10	69	
10201	949	9349		3500	5.43	6.07	−5.40	10.00	10.00	7.20	6.41	10.83	37	70	E. Frontage
10214	962	9362		3500	5.43	6.07	−5.40	11.00	11.00		6.40	10.83	13	70	
10264	1012	9412		3500	5.45	6.09	−5.40	11.00	11.00	8.00	6.38	10.85	50	70	N. 101
10299	1047	9447		3500	5.47	6.10	−5.40	10.50	10.50		6.37	10.87	35	70	
10349	1097	9497		3500	5.49	6.11	−5.40	10.50	10.50	7.70	6.35	10.89	50	70	S. 101
10362	1110	9510		3500	5.49	6.12	−5.30	10.60	10.60		6.36	10.79	13	70	
10399	1147	9547		3500	5.51	6.13	−5.30	11.00	11.00	7.90	6.34	10.81	37	70	W. Frontage
10436	1184	9584	9.20	3500	5.64	6.17	−5.40	9.00	6.00		5.84	11.04	37	76	
10543	1291	9691	9.20	3500	5.72	6.22	−5.30	9.10	9.10		5.65	11.02	107	89	
10604	1352	9752	9.20	3500	5.69	6.31	−5.13	9.10	9.10		6.33	10.82	61	88	
10605	1353	9753	9.20	3500	5.76	6.32	−5.13	9.10	9.10		5.99	10.89	1	89	
10787	1535	9935	9.20	3500	5.81	6.57	−3.80	9.00	9.00		6.99	9.61	182	78	
11004	1752	10152	9.20	3500	6.17	6.83	−3.90	9.00	9.00		6.53	10.07	217	80	
11087	1835	10235	9.20	3500	6.28	6.92	−3.90	9.00	9.00		6.43	10.18	83	80	
11186	1934	10334	9.20	3500	6.39	7.02	−3.90	9.00	9.00		6.35	10.29	99	80	
11441	2189	10589	9.20	3500	6.56	7.39	−3.00	9.00	9.00		7.32	9.56	255	80	
11540	2288	10688	9.20	3500	6.70	7.54	−3.00	9.00	9.00		7.37	9.70	99	75	
11587	2335	10735	9.20	3500	6.72	7.63	−3.00	9.00	9.00		7.65	9.72	47	62	
11588	2336	10736	9.20	3500	6.74	7.63	−4.00	9.00	9.00		7.56	10.74	1	62	
11632	2380	10780	9.20	3500	7.04	7.72	−4.31	9.20	9.20		6.62	11.35	44	52	
11685	2433	10833	10.00	3500	8.54	9.06	−4.28	10.00	10.00	4.50	5.78	12.82	53	52	Greer
11708	2456	10856	10.01	3500	8.47	9.14	−4.30	9.50	9.50		6.58	12.77	23	49	
11745	2493	10893	10.02	3500	8.01	9.36	−4.30	9.50	9.50		9.34	12.31	37	43	

Matadero Creek

HEC–2 Summary Results for the 100–Year Flood with Q = 3,500 cfs and Water Level = 3.5 ft at Palo Alto Flood Basin

(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC–2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOP WIDTH ft	LOCATION
11746	2494	10894	10.02	3500	9.08	10.19	−3.00	9.50	9.50		8.44	12.08	1	43	
11810	2558	10958	10.05	3500	9.19	10.31	−2.75	9.50	9.50		8.49	11.94	64	43	
11952	2700	11100	10.10	3500	9.26	10.41	−2.57	9.68	9.68		8.59	11.83	142	43	
12052	2800	11200	10.14	3500	9.30	10.47	−2.44	9.81	9.81		8.67	11.74	100	43	
12152	2900	11300	10.18	3500	9.36	10.54	−2.31	9.94	9.94		8.74	11.67	100	43	
12252	3000	11400	10.22	3500	9.43	10.63	−2.18	10.07	10.07		8.80	11.61	100	43	
12452	3200	11600	10.30	3500	9.49	10.74	−1.92	10.33	10.33		8.98	11.41	200	43	
12530	3378	11678	10.33	3500	9.25	10.87	−2.00	10.00	10.00		10.21	11.25	178	39	
12562	3410	11710	10.34	3500	9.46	11.05	−1.80	10.00	10.00		10.13	11.26	32	39	
12563	3411	11711	10.34	3500	9.78	11.08	−3.00	10.00	10.00		9.15	12.78	1	39	
12610	3458	11758	10.36	3500	9.82	11.12	−2.91	10.10	10.10		9.14	12.73	47	39	
12670	3518	11818	10.39	3500	9.74	11.21	−2.80	10.30	10.30		9.73	12.54	60	37	
12768	3626	11916	10.40	3500	9.68	11.36	−2.61	11.00	11.00		10.43	12.29	108	36	
12769	3627	11917	10.41	3500	9.56	11.48	−1.30	10.40	10.40		11.14	10.86	1	33	
12831	3689	11979	10.41	3500	13.83	14.76	−1.30	11.10	11.10	6.00	7.75	15.13	62	33	Louis
12832	3690	11980	11.10	3500	13.82	14.77	−1.22	11.18	11.18		7.80	15.04	1	33	
12854	3712	12002	11.15	3500	14.29	14.81	−1.00	11.00	11.00		6.18	15.29	22	60	
12872	3730	12020	11.18	3500	14.29	14.82	−0.99	11.01	11.01		6.19	15.28	18	60	
12919	3777	12067	11.28	3500	14.22	14.83	−1.00	11.50	11.50		6.56	15.22	47	60	
12952	3810	12100	11.35	3500	14.22	14.83	−0.90	11.60	11.60		6.62	15.12	33	60	
13018	3876	12166	11.48	3500	14.24	14.85	−0.71	11.80	11.80		6.63	14.94	66	62	
13046	3905	12194	11.54	3500	14.24	14.86	−0.62	11.88	11.88		6.68	14.86	29	62	
13047	3906	12195	11.54	3500	14.22	14.86	−0.70	11.80	11.80		6.75	14.92	1	60	
13351	4210	12499	12.17	3500	14.16	14.95	0.20	12.70	12.70		7.45	13.96	304	60	
13653	4512	12801	12.79	3500	14.07	15.07	1.10	13.60	13.60		8.32	12.97	302	60	
13877	4736	13025	13.25	3500	14.04	15.19	1.80	13.40	13.40		9.04	12.24	224	56	
13878	4737	13026	13.25	3500	14.05	15.19	0.47	13.60	13.60		8.94	13.58	1	56	
13902	4761	13050	13.30	3500	13.95	15.32	0.56	13.00	13.00		9.36	13.39	24	40	
13967	4826	13115	13.30	3500	16.18	17.10	0.77	13.30	13.30	10.59	7.70	15.41	65	40	Ross
13970	4829	13118	13.31	3500	16.16	17.13	0.78	13.50	13.50		7.94	15.38	3	38	
13999	4858	13147	13.40	3500	16.52	17.18	1.00	13.10	13.10		6.87	15.52	29	60	

Matadero Creek
HEC−2 Summary Results for the 100−Year Flood with Q = 3,500 cfs and Water Level = 3.5 ft at Palo Alto Flood Basin
(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC−2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOP WIDTH ft	LOCATION
16400	8105	16400	23.03	3500	24.98	26.05	11.20	23.20	23.20		8.58	13.78	222	60	
16600	8305	16600	23.40	3500	25.00	26.20	11.64	23.64	23.64		9.05	13.36	200	60	
16800	8505	16800	23.78	3500	25.02	26.38	12.08	24.08	24.08		9.56	12.94	200	60	
17000	8705	17000	24.16	3500	25.06	26.58	12.52	24.52	24.52		10.12	12.54	200	60	
17200	8905	17200	24.54	3500	24.98	26.77	12.96	24.96	24.96		10.90	12.02	200	60	
17300	9005	17300	24.73	3500	24.61	26.89	13.18	25.18	25.18		12.14	11.43	100	38	
17397	9102	17397	24.91	3500	23.74	27.20	13.40	24.90	24.90		14.92	10.34	97	36	
17442	9147	17442	25.00	3500	25.98	27.26	13.50	25.00	26.00		9.11	12.48	45	61	
17496	9201	17496	25.00	3500	25.42	27.32	13.50	25.00	25.00		11.08	11.92	54	60	
17497	9202	17497	25.00	3100	26.13	27.32	13.50	25.00	25.50		8.81	12.63	1	60	
17523	9229	17523	25.00	3100	26.03	27.34	13.55	25.05	25.05		9.25	12.48	27	60	
17543	9249	17543	25.00	3100	25.29	28.13	13.60	25.00	25.00		13.52	11.69	20	20	
17697	9403	17697	29.00	3100	28.40	30.24	13.89	29.95	29.95	23.50	10.89	14.51	154	20	Alma
17750	9456	17750	29.00	3100	28.44	30.32	14.08	30.14	30.14		11.00	14.36	53	20	
17770	9476	17770	29.00	3100	28.59	30.36	14.00	29.00	29.00		10.66	14.59	20	20	
17796	9502	17796	29.00	3100	28.61	30.39	14.09	29.00	29.00		10.71	14.51	26	20	
17900	9606	17900	29.00	3100	28.67	30.53	14.46	29.00	29.00		10.95	14.20	104	20	
18000	9706	18000	29.00	3100	28.73	30.67	14.82	29.00	29.00		11.18	13.91	100	20	
18100	9806	18100	29.00	3100	28.80	30.82	15.18	29.00	29.00		11.43	13.62	100	20	
18200	9906	18200	29.00	3100	28.86	30.98	15.54	29.00	29.00		11.68	13.32	100	20	
18277	9983	18277	29.00	3100	28.85	31.22	16.02	29.36	29.36		12.35	12.83	77	20	
18341	10047	18341	29.44	3100	30.81	32.64	16.25	29.44	29.44	27.54	10.85	14.56	64	20	Park
18350	10056	18350	29.46	3100	30.94	32.68	16.20	29.30	29.30		10.57	14.74	9	20	
18400	10106	18400	29.59	3100	30.97	32.74	16.38	29.48	29.48		10.69	14.59	50	20	
18440	10146	18440	29.70	3100	30.99	32.79	16.52	29.62	29.62		10.77	14.47	40	20	
18452	10198	18452	29.73	3100	32.18	32.93	16.80	30.00	30.00		7.39	15.38	52	64	
18600	10346	18600	30.11	3100	32.19	33.01	17.12	30.32	30.32		7.68	15.07	148	64	
18800	10546	18800	30.63	3100	32.21	33.14	17.56	30.76	30.76		8.11	14.65	200	64	
18965	10711	18965	31.06	3100	32.19	33.30	17.90	31.00	31.00		8.62	14.29	165	60	
19000	10746	19000	31.15	3100	32.21	33.33	17.98	31.08	31.08		8.65	14.23	35	60	
19063	10809	19063	31.31	3100	32.52	33.40	18.10	31.30	31.30		7.96	14.42	63	64	

Matadero Creek
HEC–2 Summary Results for the 100–Year Flood with Q = 3,500 cfs and Water Level = 3.5 ft at Palo Alto Flood Basin
(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC–2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOP WIDTH ft	LOCATION
19115	10861	19115	31.40	3100	32.25	33.74	18.30	30.30	30.30		9.81	13.95	52	25	
19196	10942	19196	31.42	3100	33.80	35.02	18.50	30.90	30.30	29.30	8.86	15.30	81	25	Lambert
19202	10948	19202	31.42	3100	34.75	35.24	18.50	31.00	31.00		6.09	16.25	6	64	
19400	11146	19400	31.75	3100	34.76	35.31	18.93	31.43	31.43		6.38	15.83	198	64	
19460	11206	19460	31.85	3100	34.55	35.43	19.00	31.80	31.80		7.56	15.55	60	45	
19600	11346	19600	32.08	3100	34.94	35.51	19.48	31.90	31.90		6.55	15.46	140	64	
19800	11546	19800	32.41	3100	34.96	35.60	19.92	32.34	32.34		6.89	15.04	200	64	
19900	11646	19900	32.59	3100	34.97	35.64	20.14	32.56	32.56		7.07	14.83	100	64	
1015	11711	1015		1800	33.82	36.19	21.62	33.74	33.74		12.35	12.20	65	12	
1150	11846	1150		1800	34.13	36.53	22.02	34.14	34.14		12.45	12.11	135	12	
1500	12196	1500		1800	34.95	37.45	23.07	35.19	35.19		12.69	11.88	350	12	
2000	12696	2000		1800	36.20	38.81	24.57	36.69	36.69		12.95	11.63	500	12	
2050	12746	2050		1800	36.32	38.95	24.75	36.87	36.87		13.03	11.57	50	12	
2500	13196	2500		1800	37.46	40.34	26.40	38.51	38.51		13.64	11.06	450	12	
2590	13286	2590		1800	37.71	40.63	26.72	38.84	38.84		13.72	10.99	90	12	
3000	13296	3000		1600	37.54	40.76	28.22	40.34	40.34		14.40	9.32	10	12	
3025	13321	3025		1600	37.63	40.85	28.31	40.43	40.43		14.41	9.32	25	12	
3050	13346	3050		1600	37.73	40.95	28.40	40.52	40.52		14.40	9.32	25	12	
3075	13371	3075		1600	37.83	41.04	28.49	40.61	40.61		14.39	9.33	25	12	
3100	13396	3100		1600	37.93	41.13	28.59	40.71	40.71		14.38	9.34	25	12	
3125	13421	3125		1600	38.02	41.23	28.68	40.80	40.80		14.36	9.35	25	12	
3150	13446	3150		1600	38.12	41.32	28.77	40.89	40.89		14.35	9.36	25	12	
3200	13496	3200		1600	38.32	41.51	28.95	41.07	41.07		14.34	9.37	50	12	
3300	13596	3300		1600	38.70	41.88	29.32	41.44	41.44		14.32	9.38	100	12	
3400	13696	3400		1600	39.08	42.25	29.68	41.80	41.80		14.29	9.40	100	12	
3465	13761	3465		1600	39.33	42.49	29.92	42.04	42.04		14.28	9.41	65	12	
3515	13811	3515		1600	39.52	42.67	30.10	42.22	42.22		14.26	9.42	50	12	
3550	13846	3550		1600	39.65	42.80	30.23	42.35	42.35		14.25	9.42	35	12	
3595	13891	3595		1600	40.81	44.93	32.57	44.69	44.69		16.30	8.24	45	12	
3640	13936	3640		1600	43.15	47.27	34.91	47.03	47.03		16.30	8.24	45	12	
3690	13986	3690		1600	45.75	49.87	37.51	49.63	49.63		16.30	8.24	50	12	

Matadero Creek

HEC–2 Summary Results for the 100–Year Flood with Q = 3,500 cfs and Water Level = 3.5 ft at Palo Alto Flood Basin

(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC–2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOP WIDTH ft	LOCATION
3700	13996	3700		1600	46.27	50.40	38.03	50.15	50.15		16.30	8.24	10	12	
3715	14011	3715		1600	46.35	50.47	38.10	50.23	50.23		16.29	8.24	15	12	
3730	14026	3730		1600	46.43	50.55	38.18	50.30	50.30		16.29	8.25	15	12	
4633	14929	4633		1600	51.54	53.84	40.52	52.64	52.64		12.17	11.02	903	12	
5133	15429	5133		1600	52.27	56.40	44.03	56.15	56.15		16.31	8.24	500	12	
5657	15953	5657		1600	55.98	60.11	47.74	59.86	59.86		16.30	8.24	524	12	
5677	15973	5677		1600	56.12	60.25	47.88	62.00	62.00		16.30	8.24	20	12	
5728	16024	5728		1000	59.76	60.68	48.88	63.00	63.00		7.70	10.88	51	12	
5769	16065	5769		1000	59.74	60.76	49.38	63.50	63.50		8.09	10.36	41	12	
5785	16081	5785		1000	60.16	60.81	51.00	65.12	65.12		6.46	9.16	16	17	
5809	16105	5809		1000	60.43	60.84	53.50	65.00	65.00		5.15	6.93	24	28	

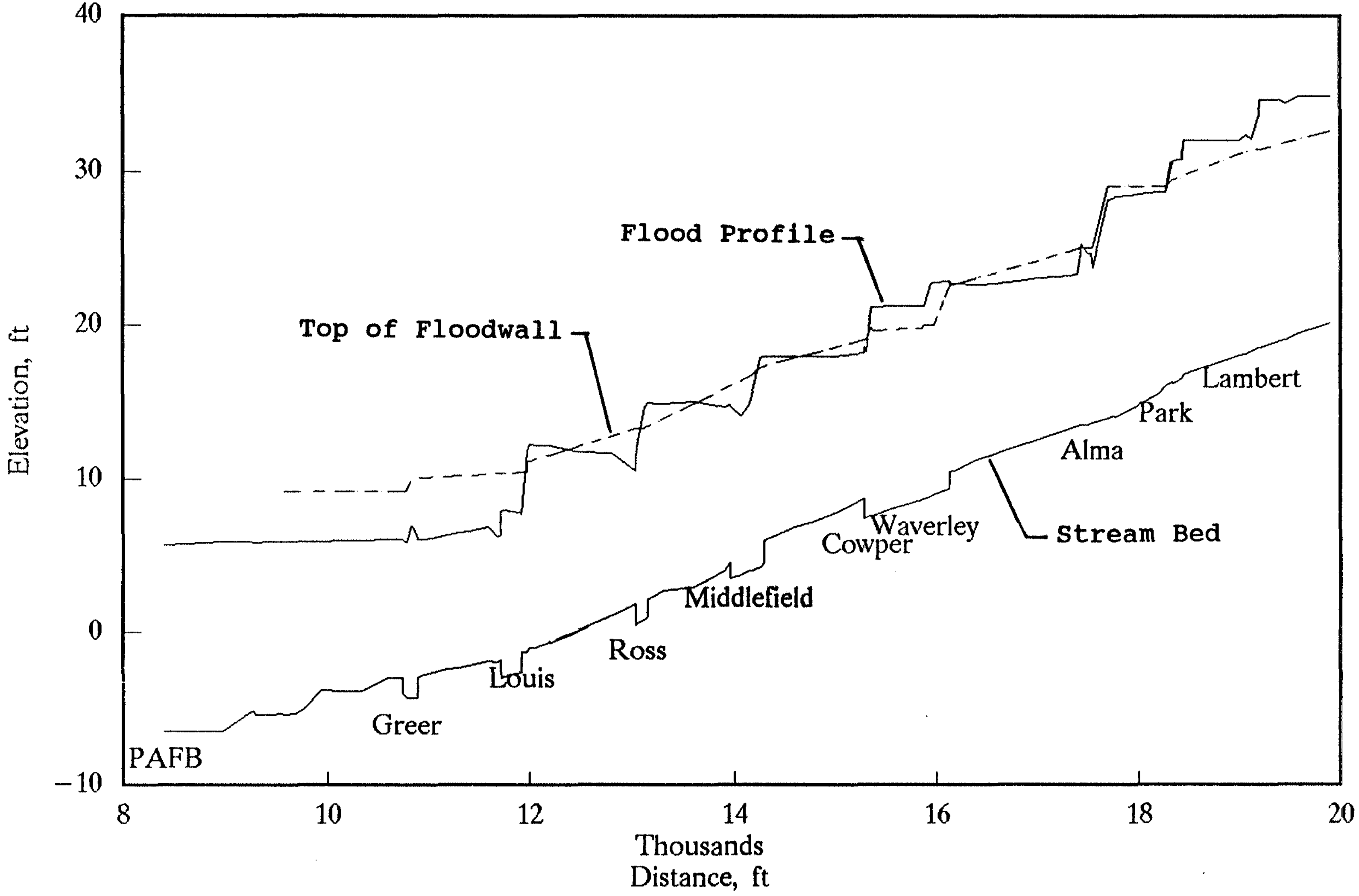
Attachment 2:

Matadero Creek HEC-2 Summary Results for the 100-Year Flood

with
Q = 1,500 cfs
WS = 5.7 ft at PAFB

Matadero Creek

The 100-Year Flood (Q = 1,500 cfs / Tide = 5.7 ft at PAFB)



Matadero Creek
HEC−2 Summary Results for the 100−Year Flood with Q = 1,500 cfs and Water Level = 5.7 ft at Palo Alto Flood Basin

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC−2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOP WIDTH ft	LOCATION
9252	0	8400		1500	5.70	5.76	−6.50	−0.10	6.20		2.25	12.20	0	126	PAFB
9452	200	8600		1500	5.77	5.82	−6.50	−0.10	6.20		2.22	12.27	200	126	
9652	400	8800		1500	5.83	5.88	−6.50	−0.10	6.20		2.20	12.33	200	127	
9827	575	8975		1500	5.90	5.92	−6.50	−0.10	6.20		1.09	12.40	175	231	
10107	855	9255		1500	5.92	5.94	−5.20	0.20	6.00		1.26	11.12	280	257	
10123	871	9271		1500	5.86	5.96	−5.20	3.00	7.00		2.53	11.06	16	75	
10144	892	9292		1500	5.86	5.97	−5.40	7.50	7.50		2.60	11.26	21	71	
10154	902	9302		1500	5.86	5.97	−5.40	7.50	7.50	7.00	2.60	11.26	10	71	Ped Bridge
10164	912	9312		1500	5.86	5.97	−5.40	10.00	10.00		2.62	11.26	10	70	
10201	949	9349		1500	5.86	5.97	−5.40	10.00	10.00	7.20	2.60	11.26	37	71	E. Frontage
10214	962	9362		1500	5.87	5.97	−5.40	11.00	11.00		2.60	11.27	13	71	
10264	1012	9412		1500	5.87	5.97	−5.40	11.00	11.00	8.00	2.60	11.27	50	71	N. 101
10299	1047	9447		1500	5.87	5.97	−5.40	10.50	10.50		2.60	11.27	35	71	
10349	1097	9497		1500	5.87	5.97	−5.40	10.50	10.50	7.70	2.60	11.27	50	71	S. 101
10362	1110	9510		1500	5.87	5.97	−5.30	10.60	10.60		2.60	11.17	13	71	
10399	1147	9547		1500	5.87	5.98	−5.30	11.00	11.00	7.90	2.60	11.17	37	71	W. Frontage
10436	1184	9584	9.20	1500	5.89	5.98	−5.40	9.00	9.00		2.43	11.29	37	77	
10543	1291	9691	9.20	1500	5.90	5.99	−5.30	9.10	9.10		2.36	11.20	107	91	
10604	1352	9752	9.20	1500	5.90	6.00	−5.13	9.10	9.10		2.62	11.03	61	91	
10605	1353	9753	9.20	1500	5.91	6.01	−5.13	9.10	9.10		2.51	11.04	1	91	
10787	1535	9935	9.20	1500	5.92	6.05	−3.80	9.00	9.00		2.95	9.72	182	80	
11004	1752	10152	9.20	1500	5.97	6.10	−3.90	9.00	9.00		2.89	9.87	217	80	
11087	1835	10235	9.20	1500	5.99	6.12	−3.90	9.00	9.00		2.87	9.89	83	80	
11186	1934	10334	9.20	1500	6.01	6.14	−3.90	9.00	9.00		2.88	9.91	99	79	
11441	2189	10589	9.20	1500	6.04	6.22	−3.00	9.00	9.00		3.43	9.04	255	76	
11540	2288	10688	9.20	1500	6.07	6.26	−3.00	9.00	9.00		3.48	9.07	99	66	
11587	2335	10735	9.20	1500	6.08	6.28	−3.00	9.00	9.00		3.59	9.08	47	62	
11588	2336	10736	9.20	1500	6.08	6.28	−4.00	9.00	9.00		3.56	10.08	1	62	
11632	2380	10780	9.20	3100	5.85	6.54	−4.31	9.20	9.20		6.65	10.16	44	52	
11685	2433	10833	10.00	3100	6.89	7.44	−4.28	10.00	10.00	4.50	5.97	11.17	53	52	Greer
11708	2456	10856	10.01	3100	6.80	7.54	−4.30	9.50	9.50		6.88	11.10	23	49	
11745	2493	10893	10.02	3100	6.14	7.85	−4.30	9.50	9.50		10.51	10.44	37	43	

Matadero Creek
HEC-2 Summary Results for the 100-Year Flood with Q = 1,500 cfs and Water Level = 5.7 ft at Palo Alto Flood Basin
(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC-2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOPWID ft	LOCATION
11746	2494	10894	10.02	3100	6.07	7.88	−3.00	9.50	9.50		10.81	9.07	1	43	
11810	2558	10958	10.05	3100	6.02	7.96	−2.75	9.50	9.50		11.17	8.77	64	43	
11952	2700	11100	10.10	3100	6.20	8.14	−2.57	9.68	9.68		11.19	8.77	142	43	
12052	2800	11200	10.14	3100	6.33	8.27	−2.44	9.81	9.81		11.18	8.77	100	43	
12152	2900	11300	10.18	3100	6.46	8.40	−2.31	9.94	9.94		11.18	8.77	100	43	
12252	3000	11400	10.22	3100	6.58	8.53	−2.18	10.07	10.07		11.18	8.77	100	43	
12452	3200	11600	10.30	3100	6.84	8.78	−1.92	10.33	10.33		11.19	8.76	200	43	
12530	3378	11678	10.33	3100	6.23	9.18	−2.00	10.00	10.00		13.79	8.23	178	39	
12562	3410	11710	10.34	3100	6.36	9.32	−1.80	10.00	10.00		13.79	8.16	32	39	
12563	3411	11711	10.34	3100	7.89	9.46	−3.00	10.00	10.00		10.05	10.89	1	39	
12610	3458	11758	10.36	3100	7.96	9.51	−2.91	10.10	10.10		9.98	10.87	47	39	
12670	3518	11818	10.39	3100	7.87	9.63	−2.80	10.30	10.30		10.67	10.67	60	37	
12768	3626	11916	10.40	3100	7.78	9.85	−2.61	11.00	11.00		11.55	10.39	108	36	
12769	3627	11917	10.41	3100	7.64	10.00	−1.30	10.40	10.40		12.31	8.94	1	33	
12831	3689	11979	10.41	3100	11.84	12.84	−1.30	11.10	11.10	6.00	8.01	13.14	62	33	Louis
12832	3690	11980	11.10	3100	11.83	12.84	−1.22	11.18	11.18		8.07	13.05	1	33	
12854	3712	12002	11.15	3100	12.26	12.89	−1.00	11.00	11.00		6.68	13.26	22	60	
12872	3730	12020	11.18	3100	12.27	12.90	−0.99	11.01	11.01		6.69	13.26	18	60	
12919	3777	12067	11.28	3100	12.17	12.91	−1.00	11.50	11.50		7.20	13.17	47	60	
12952	3810	12100	11.35	3100	12.16	12.92	−0.90	11.60	11.60		7.28	13.06	33	60	
13018	3876	12166	11.48	3100	12.18	12.95	−0.71	11.80	11.80		7.34	12.88	66	62	
13046	3905	12194	11.54	3100	12.17	12.96	−0.62	11.88	11.88		7.42	12.79	29	62	
13047	3906	12195	11.54	3100	12.16	12.96	−0.70	11.80	11.80		7.46	12.86	1	60	
13351	4210	12499	12.17	3100	11.75	13.11	0.20	12.70	12.70		9.37	11.55	304	36	
13653	4512	12801	12.79	3100	11.63	13.36	1.10	13.60	13.60		10.54	10.53	302	36	
13877	4736	13025	13.25	3100	10.49	13.69	1.80	13.40	13.40		14.36	8.69	224	35	
13878	4737	13026	13.25	3100	11.40	13.70	0.47	13.60	13.60		12.15	10.93	1	35	
13902	4761	13050	13.30	3100	12.44	13.96	0.56	13.00	13.00		9.88	11.88	24	40	
13967	4826	13115	13.30	3100	14.63	15.60	0.77	13.30	13.30	10.59	7.90	13.86	65	40	Ross
13970	4829	13118	13.31	3100	14.60	15.63	0.78	13.50	13.50		8.12	13.82	3	38	
13999	4858	13147	13.40	3100	14.93	15.67	1.00	13.10	13.10		7.23	13.93	29	60	

Matadero Creek
HEC−2 Summary Results for the 100−Year Flood with Q = 1,500 cfs and Water Level = 5.7 ft at Palo Alto Flood Basin
(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC−2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOPWID ft	LOCATION
14000	4859	13148	13.41	3100	14.92	15.67	2.10	13.10	13.10		7.31	12.82	1	60	
14093	4952	13241	13.70	3100	14.89	15.73	2.50	13.50	13.50		7.71	12.39	93	60	
14155	5014	13303	13.90	3100	14.88	15.77	2.70	13.70	13.70		7.92	12.18	62	60	
14457	5316	13605	14.87	3100	15.01	15.92	2.90	13.90	13.90		7.99	12.11	302	60	
14757	5616	13905	15.83	3100	14.63	16.35	4.00	15.00	15.00		10.55	10.63	300	36	
14813	5672	13961	16.01	3100	14.77	16.42	4.50	16.00	16.00		10.29	10.27	56	37	
14814	5673	13962	16.01	3100	14.70	16.45	3.50	16.00	16.00		10.60	11.20	1	37	
14924	5783	14072	16.37	3100	14.08	16.93	3.70	16.20	16.20		13.55	10.38	110	35	
14994	5853	14142	16.59	3100	14.76	17.10	4.00	16.50	16.50		12.29	10.76	70	35	
15028	5887	14176	16.70	3100	15.40	17.29	4.03	16.70	16.70		11.02	11.37	34	38	
14266	5977	14266	17.20	3100	17.87	18.98	4.26	17.20	17.20	14.39	8.47	13.61	90	38	Middlefield
14299	6010	14299	17.30	3100	17.93	19.01	4.50	17.20	17.20		8.48	13.43	33	56	
14300	6011	14300	17.30	3100	17.93	19.01	6.00	17.20	17.20		8.49	11.93	1	56	
14406	6117	14406	17.48	3100	17.92	19.09	6.28	17.28	17.40		8.82	11.64	106	56	
14606	6317	14606	17.83	3100	17.91	19.29	6.84	17.84	17.84		9.52	11.07	200	56	
14806	6517	14806	18.17	3100	17.90	19.53	7.20	18.40	18.40		10.24	10.70	200	38	
15000	6711	15000	18.51	3100	17.95	19.80	7.70	19.00	19.50		10.92	10.25	194	38	
15287	6998	15287	19.00	3100	18.13	20.22	8.70	19.00	19.50		11.61	9.43	287	38	
15288	6999	15288	19.00	3100	18.49	20.26	7.37	19.00	19.50		10.66	11.12	1	38	
15310	7021	15310	19.00	3100	18.26	20.54	7.45	19.00	19.00		12.12	10.81	22	34	
15359	7070	15359	19.80	3100	21.06	22.29	7.56	19.80	19.80	17.10	8.90	13.50	49	35	Cowper
15375	7086	15375	19.61	3100	21.17	22.32	7.60	19.80	19.80		8.74	13.57	16	46	
15600	7311	15600	19.69	3100	21.20	22.48	8.07	19.90	19.80		9.26	13.13	225	46	
15675	7386	15675	19.72	3100	21.21	22.54	8.23	20.06	19.90		9.42	12.98	75	46	
15855	7566	15855	19.79	3100	21.24	22.69	8.62	20.50	20.50		9.82	12.62	180	46	
15874	7585	15874	20.00	3100	21.23	22.73	8.67	20.00	20.00		9.83	12.56	19	34	
15947	7658	15947	20.00	3100	22.68	23.83	8.82	20.00	20.00	19.00	8.62	13.86	73	34	Waverley
15972	7683	15972	20.00	3100	22.75	23.86	9.00	21.00	21.00		8.49	13.75	25	39	
16123	7834	16123	22.50	3100	22.81	23.95	9.33	22.73	22.73		8.68	13.48	151	60	
16124	7835	16124	22.50	3100	22.70	23.99	10.40	22.40	22.40		9.27	12.30	1	60	
16172	7883	16172	22.59	3100	22.71	24.04	10.50	22.50	22.50		9.39	12.21	48	60	

Matadero Creek
HEC−2 Summary Results for the 100−Year Flood with Q = 1,500 cfs and Water Level = 5.7 ft at Palo Alto Flood Basin
(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC−2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOPWID ft	LOCATION
16400	8105	16400	23.03	3100	22.57	24.39	11.20	23.20	23.20		10.82	11.37	222	38	
16600	8305	16600	23.40	3100	22.70	24.68	11.64	23.64	23.64		11.29	11.06	200	38	
16800	8505	16800	23.78	3100	22.85	25.00	12.08	24.08	24.08		11.75	10.77	200	38	
17000	8705	17000	24.16	3100	23.04	25.35	12.52	24.52	24.52		12.19	10.52	200	38	
17200	8905	17200	24.54	3100	23.13	25.69	12.96	24.96	24.96		12.84	10.17	200	38	
17300	9005	17300	24.73	3100	23.18	25.88	13.18	25.18	25.18		13.20	10.00	100	38	
17397	9102	17397	24.91	3100	23.28	26.42	13.40	24.90	24.90		14.21	9.88	97	36	
17442	9147	17442	25.00	3100	25.24	26.48	13.50	25.00	26.00		8.96	11.74	45	56	
17496	9201	17496	25.00	3100	24.65	26.54	13.50	25.00	25.00		11.01	11.15	54	36	
17497	9202	17497	25.00	3100	24.65	26.54	13.50	25.00	25.50		11.01	11.15	1	36	
17523	9229	17523	25.00	3100	24.62	26.57	13.55	25.05	25.05		11.19	11.07	27	37	
17543	9249	17543	25.00	3100	23.72	27.54	13.60	25.00	25.00		15.67	10.12	20	20	
17697	9403	17697	29.00	3100	28.15	30.06	13.89	29.95	29.95	23.50	11.09	14.26	154	20	Alma
17750	9456	17750	29.00	3100	28.20	30.14	14.08	30.14	30.14		11.20	14.12	53	20	
17770	9476	17770	29.00	3100	28.35	30.18	14.00	29.00	29.00		10.84	14.35	20	20	
17796	9502	17796	29.00	3100	28.37	30.21	14.09	29.00	29.00		10.89	14.28	26	20	
17900	9606	17900	29.00	3100	28.43	30.36	14.46	29.00	29.00		11.13	13.97	104	20	
18000	9706	18000	29.00	3100	28.50	30.51	14.82	29.00	29.00		11.37	13.68	100	20	
18100	9806	18100	29.00	3100	28.57	30.67	15.18	29.00	29.00		11.62	13.39	100	20	
18200	9906	18200	29.00	3100	28.64	30.83	15.54	29.00	29.00		11.88	13.10	100	20	
18277	9983	18277	29.00	3100	28.63	31.08	16.02	29.36	29.36		12.57	12.61	77	20	
18341	10047	18341	29.44	3100	30.59	32.48	16.25	29.44	29.44	27.54	11.02	14.34	64	20	Park
18350	10056	18350	29.46	3100	30.73	32.52	16.20	29.30	29.30		10.73	14.53	9	20	
18400	10106	18400	29.59	3100	30.76	32.59	16.38	29.48	29.48		10.84	14.38	50	20	
18440	10146	18440	29.70	3100	30.79	32.64	16.52	29.62	29.62		10.92	14.26	40	20	
18452	10198	18452	29.73	3100	31.98	32.78	16.80	30.00	30.00		7.57	15.18	52	64	
18600	10346	18600	30.11	3100	32.00	32.87	17.12	30.32	30.32		7.87	14.87	148	64	
18800	10546	18800	30.63	3100	32.02	33.00	17.56	30.76	30.76		8.32	14.46	200	64	
18965	10711	18965	31.06	3100	31.99	33.18	17.90	31.00	31.00		8.87	14.09	165	60	
19000	10746	19000	31.15	3100	32.02	33.21	17.98	31.08	31.08		8.90	14.04	35	60	
19063	10809	19063	31.31	3100	32.37	33.28	18.10	31.30	31.30		8.12	14.27	63	64	

Matadero Creek
HEC−2 Summary Results for the 100−Year Flood with Q = 1,500 cfs and Water Level = 5.7 ft at Palo Alto Flood Basin
(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC−2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOPWID ft	LOCATION
19115	10861	19115	31.40	3100	32.09	33.63	18.30	30.30	30.30		9.93	13.79	52	25	
19196	10942	19196	31.42	3100	33.66	34.91	18.50	30.90	30.30	29.30	8.95	15.16	81	25	Lambert
19202	10948	19202	31.42	3100	34.63	35.13	18.50	31.00	31.00		6.17	16.13	6	64	
19400	11146	19400	31.75	3100	34.64	35.20	18.93	31.43	31.43		6.47	15.71	198	64	
19460	11206	19460	31.85	3100	34.43	35.33	19.00	31.80	31.80		7.66	15.43	60	45	
19600	11346	19600	32.08	3100	34.82	35.41	19.48	31.90	31.90		6.64	15.34	140	64	
19800	11546	19800	32.41	3100	34.84	35.50	19.92	32.34	32.34		6.99	14.92	200	64	
19900	11646	19900	32.59	3100	34.85	35.55	20.14	32.56	32.56		7.17	14.71	100	64	
1015	11711	1015		1800	33.69	36.11	21.62	33.74	33.74		12.49	12.07	65	12	
1150	11846	1150		1800	34.00	36.46	22.02	34.14	34.14		12.58	11.98	135	12	
1500	12196	1500		1800	34.85	37.39	23.07	35.19	35.19		12.80	11.78	350	12	
2000	12696	2000		1800	36.14	38.77	24.57	36.69	36.69		13.03	11.57	500	12	
2050	12746	2050		1800	36.25	38.92	24.75	36.87	36.87		13.10	11.50	50	12	
2500	13196	2500		1800	37.41	40.32	26.40	38.51	38.51		13.69	11.02	450	12	
2590	13286	2590		1800	37.67	40.61	26.72	38.84	38.84		13.77	10.95	90	12	
3000	13296	3000		1600	37.49	40.74	28.22	40.34	40.34		14.48	9.27	10	12	
3025	13321	3025		1600	37.58	40.84	28.31	40.43	40.43		14.49	9.27	25	12	
3050	13346	3050		1600	37.68	40.93	28.40	40.52	40.52		14.47	9.28	25	12	
3075	13371	3075		1600	37.78	41.03	28.49	40.61	40.61		14.46	9.29	25	12	
3100	13396	3100		1600	37.89	41.13	28.59	40.71	40.71		14.44	9.30	25	12	
3125	13421	3125		1600	37.99	41.22	28.68	40.80	40.80		14.42	9.32	25	12	
3150	13446	3150		1600	38.09	41.32	28.77	40.89	40.89		14.40	9.33	25	12	
3200	13496	3200		1600	38.30	41.50	28.95	41.07	41.07		14.37	9.35	50	12	
3300	13596	3300		1600	38.71	41.88	29.32	41.44	41.44		14.28	9.40	100	12	
3400	13696	3400		1600	39.08	42.25	29.68	41.80	41.80		14.27	9.40	100	12	
3465	13761	3465		1600	39.32	42.48	29.92	42.04	42.04		14.27	9.41	65	12	
3515	13811	3515		1600	39.51	42.67	30.10	42.22	42.22		14.27	9.41	50	12	
3550	13846	3550		1600	39.64	42.80	30.23	42.35	42.35		14.26	9.41	35	12	
3595	13891	3595		1600	40.81	44.93	32.57	44.69	44.69		16.30	8.24	45	12	
3640	13936	3640		1600	43.15	47.27	34.91	47.03	47.03		16.30	8.24	45	12	
3690	13986	3690		1600	45.75	49.87	37.51	49.63	49.63		16.30	8.24	50	12	

Matadero Creek
HEC-2 Summary Results for the 100-Year Flood with Q = 1,500 cfs and Water Level = 5.7 ft at Palo Alto Flood Basin
(Continued)

PLAN SECNO ft	ACCUM. DISTANCE ft	HEC-2 SECNO ft	TOP F/W ft	Q cfs	WATER LEVEL ft	EG ft	ELMIN ft	XLBEL ft	RBEL ft	SOFFIT ft	VEL ft/sec	DEPTH ft	XLCH ft	TOPWID ft	LOCATION
3700	13996	3700		1600	46.27	50.40	38.03	50.15	50.15		16.30	8.24	10	12	
3715	14011	3715		1600	46.35	50.47	38.10	50.23	50.23		16.29	8.24	15	12	
3730	14026	3730		1600	46.43	50.55	38.18	50.30	50.30		16.29	8.25	15	12	
4633	14929	4633		1600	51.54	53.84	40.52	52.64	52.64		12.17	11.02	903	12	
5133	15429	5133		1600	52.27	56.40	44.03	56.15	56.15		16.31	8.24	500	12	
5657	15953	5657		1600	55.98	60.11	47.74	59.86	59.86		16.30	8.24	524	12	
5677	15973	5677		1600	56.12	60.25	47.88	62.00	62.00		16.30	8.24	20	12	
5728	16024	5728		1000	59.76	60.68	48.88	63.00	63.00		7.70	10.88	51	12	
5769	16065	5769		1000	59.74	60.76	49.38	63.50	63.50		8.09	10.36	41	12	
5785	16081	5785		1000	60.16	60.81	51.00	65.12	65.12		6.46	9.16	16	17	
5809	16105	5809		1000	60.43	60.84	53.50	65.00	65.00		5.15	6.93	24	28	Bypass Intake